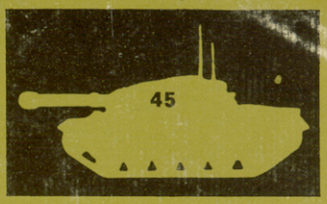
PROFILE

AFV WEAPONS

September 1973



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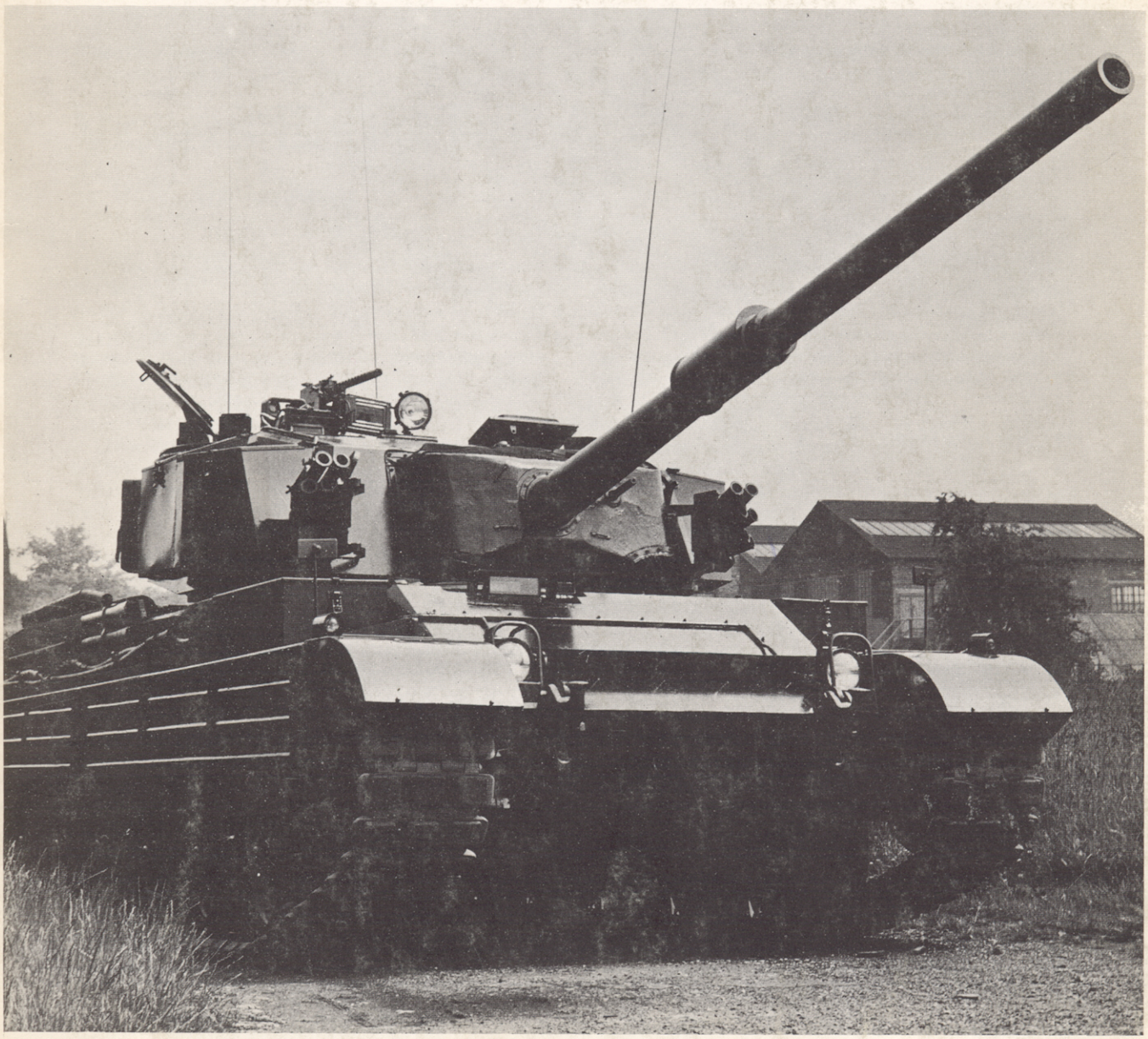
Vickers Battle Tank

by R. M. Ogorkiewicz



AFV/Weapons Profiles

Edited by **DUNCAN CROW**

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During the past 12 months we like everyone else have been faced with the task of absorbing steadily rising costs. Recent heavy production cost increases now make it impossible to absorb these any more.

So many readers have indicated to us that they appreciate the high quality standards achieved to date in the series that we have concluded that to reduce either quality or content to compensate for these rising costs, is not what you our readers require of us.

Regretfully, therefore, the recommended retail selling price is increased to 45p for the current series as from the 1 August 1973.

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Prototype of the Vickers battle tank.

Vickers Battle Tank

by R. M. Ogorkiewicz

THE growing complexity of tanks and the consequent rise in the cost of their development have made it increasingly difficult for industrial companies to produce new designs of their own. As a result, tank design has become a monopoly of government departments, even where free enterprise has survived in the field of tank production because the designs produced by industry are government prescribed.

There is, however, one very notable exception to this in the Vickers battle tank. This tank was designed by Vickers Limited on their own initiative and its development background is very different therefore from that of all other contemporary battle tanks.

The enterprise which Vickers have displayed in developing their battle tank is, however, in keeping with their long and distinguished record in the tank field. Vickers have, in fact, a longer record of developing tanks than any other company or government establishment in the world, as it goes back, without a break, to the end of the First World War. Moreover, during the fifty-odd years of their involvement with tanks Vickers produced several noteworthy designs of their own, as well as many others to British Army requirements.

VICKERS DESIGN

One of the most important of the tanks which Vickers, or Vickers-Armstrongs as they then were, designed on their own initiative was the 6-ton Tank which became the forerunner of what was the most successful type of tank during the 1930s, namely the so-called 'light-medium'. Another noteworthy private venture of Vickers-Armstrongs was the design of the Valentine infantry tank in 1938. In doing this they took advantage of the sound mechanical features of the A.9 and A.10 cruiser tanks developed earlier to War Office requirements but, at the same time, rejected their extravagantly large, 5 to 6-man crews, as well as other questionable features, and produced a tank which enjoyed a reputation for reliability unsurpassed by any other British tank of the Second World War.

After the Second World War Vickers-Armstrongs played a leading role in the development and production of the Centurion, which restored the reputation of British tanks after the damage it had suffered during the war as a result of the doctrinaire tank policies pursued during the 1930s and early 1940s by the War Office. More recently Vickers have played a major role in the development and production of the Chieftain, the most powerful battle tank of the 1960s.

At the same time as they worked to British Army requirements on the Centurion and the Chieftain, Vickers resumed their own studies of tank design. In particular, they focussed their attention on the design of tanks which would be lighter and less expensive than those they were producing for the British Army and which would be better suited to the requirements of other armies.

Thus, by 1960 the design office at the Elswick Works of Vickers-Armstrongs (Engineers) Ltd., in Newcastle-upon-Tyne, produced the design of a light tank armed with the same 83.4mm 20-pounder gun as that with which the Centurions had been armed but having only half their weight. In fact, according to Vickers Design No. 45569 T, the light tank was to weigh only 24 tons, fully laden. As a result its nominal ground pressure would have been only 0.59 kg/cm^2. Moreover, it was to

P.1 prototype of the Vickers battle tank.

have been powered by a 530 h.p. engine, which would have given it a power-to-weight ratio of no less than 22 h.p. per tonne.

The general layout of the light tank was conventional and resembled that of the Centurion. Vickers did not, therefore, propose to incorporate in it any untried major features which might have jeopardised its reliability or made it expensive to produce. In fact, in contrast to the Centurion, its turret as well as its hull was to be welded from rolled armour plate, which would have helped to keep its cost down as well as being more in keeping with its relatively light armour.

The design of the light tank did, however, embody a number of advances on that of the Centurion. In particular, it was to have an independent suspension with five road wheels on each side, mounted on trailing arms and sprung by transversely located torsion bars. Its main armament of the 83.4mm 20-pounder, for which it was to carry 40 rounds, was also to be supplemented by eight Vigilant anti-tank guided missiles. The missiles were stowed in the turret bustle and were to be raised into their firing position one-by-one through a special hatch in the turret roof. The idea of using missiles to augment the fire power of gun-armed tanks was then still something of a novelty and was encouraged by the fact that the Vigilant was developed, originally as a private venture, by what was another part of the Vickers organisation – Vickers-Armstrongs (Aircraft) Ltd.

105mm GUN TANK

For all its attractive features, the light tank was never built. By 1960 the 83.4mm gun of the Centurion had been dropped in favour of the 105mm gun, whose original barrel was, incidentally, that of the 20-pounder bored out to the larger calibre. In addition to the Centurion, the 105mm gun was adopted for the US M60 battle tank and was being incorporated in the design of the new Swiss Pz.61 and German Leopard battle tanks. Thus, had it been built, the proposed Vickers light tank would no longer have been as well armed as the latest battle tanks. At the same time it was not light enough for the reconnaissance and similar roles traditionally assigned to light tanks.

In consequence, Vickers turned their attention to a more powerful type of tank armed with a 105mm gun. This led, in mid-1961, to Design No. 46200 T. Apart from having a 105mm gun, the new tank was to have armour twice as thick as the light tank which preceded

Vickers 105mm gun tank prototype.

Note the rubber padded track and the driver's periscope.

it, although still thinner than that of the Centurion. On the other hand, although heavier than the light tank, it was to be considerably lighter than the Centurion and more mobile. In fact, its weight, fully laden, was estimated to be 40 tonnes, while the re-armed, 105mm gun Centurion weighed 52 tonnes.

Except that it dispensed with the Vigilant guided missiles and had one more road wheel per side, the general layout of the Vickers 105mm gun tank resembled that of the earlier light tank. Its major automotive components were, however, to be the same as those of the Chieftain battle tank, the first prototype of which was completed in September 1959. In particular, it was to have the same Leyland L.60 engine and the same Merritt-Wilson TN-12 transmission.

After they began to design the 105mm gun tank Vickers entered into discussions with the Indian Government concerning the production of battle tanks in India. This was first mooted in the winter of 1959–1960 and the discussions led to a formal agreement, which was signed in August 1961, under which Vickers undertook to develop a battle tank and to help set up a factory in India to produce it.

As a result, Vickers proceeded to develop their 105mm gun tank design and to build two prototypes, the first of which was completed in 1963. During the following year one of the two prototypes was sent to India for evaluation by the Indian Army, while the second was kept in England for development trials. In the course of its development some details of the Vickers battle tank were inevitably modified but in essence its form came to correspond to Design No. 51025 T, which was established in 1964.

DESIGN No. 51025 T

The principal difference between Design No. 51025 T and Design No. 46200 T of 1961 was that the weight of the Vickers 105mm gun tank was reduced by about two tonnes, making it comparable to the lightest of the contemporary battle tanks. Thus the Vickers tank now weighed 36 tonnes unladen. Fully laden it weighed 38 tonnes, or 37½ English tons, which led to it being called the Vickers 37-ton Tank.

In essence, the layout of the 37-ton Tank has been conventional. Thus, as in almost all other contemporary tanks, the forward part of its hull is occupied by the driver's compartment and the ammunition stowage. The centre of the hull contains the fighting compartment and is surmounted by the turret which carries the main and secondary armament. The rear part of the hull is taken up by the engine and transmission compartment.

The hull is welded from homogeneous rolled steel armour plates which provide a reasonable degree of protection for the crew and the components located in it. The protection provided by the Vickers tank is inevitably inferior to that of the much heavier Chieftain but it is

Vickers battle tank Mark 1 with trough for flotation screen.

Vickers battle tank Mark 1.

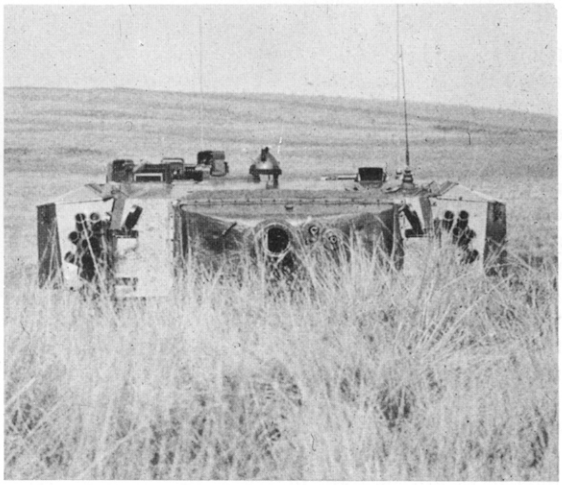
Vickers battle tank Mark 1.

Vickers battle tank moving at speed: note the absence of the trough for the flotation screen.

very similar to that of other tanks of its weight, except for Russian tanks, which have thicker armour but at the cost of cramped crew compartments. The Vickers tank, on the other hand, has a relatively roomy hull to enable its crew to operate it more efficiently, particularly under tropical or semi-tropical conditions.

Of the four men who make up the crew, the driver is located on the right of the forward section of the hull and his compartment contains all the vehicle instruments and driving controls. Access to the driver's compartment is by means of a spring-assisted swivel hatch, fitted in the hull top plate immediately over the driver's seat, which can be lifted, swung clear of the hatchway and secured in the open position by means of spring-loaded catches in the hull. This, together with the fully adjustable seat, enables the driver to drive the tank in the 'up' position, that is with his head and shoulders outside the vehicle. For driving in the down position the driver has a single, wide-angle periscope.

An opening is provided in the bulkhead between the forward and centre compartments immediately



Turret of a Vickers battle tank in a hull down position.

Vickers battle tank in a hull down position.

View showing port in side of turret.

behind the driver to allow him to enter or leave his station through the fighting compartment. This makes it possible for the crew to change their positions without opening up the tank and, in addition, serves as a means of escape.

Access to the fighting compartment is by means of two hatches in the turret roof: one above the commander's station and the other above the loader's station. As in almost all other battle tanks, the commander's station is on the right of the turret and the loader's on the left. The only battle tanks to which this does not apply are Russian where, appropriately enough, the commander sits on the left. The commander's hatch is in a rotating, hand-traversed cupola with six unity vision periscopes for all-round observation and a periscopic binocular for long-range observation and target detection. The loader is provided with a single periscope and the gunner, who sits immediately in front of the commander, has a sighting periscope.

The turret itself is welded from homogeneous rolled steel plates. This made it unique until the appearance of the US-German MBT-70 experimental battle tank, first built in prototype form in 1967, and the more recent German Leopard II, whose turrets have also been fabricated from rolled plates. Turrets of all other battle tanks since the Second World War have been cast, as this made it easier to shape them for maximum ballistic protection. However, cast armour is inferior to some extent to rolled armour plates and requires special foundry facilities, which were not available, for instance, in India at the time the Vickers tank was developed.

The front plate of the turret has mounted in it, on trunnions, the 105mm gun which can be elevated to a maximum of 20 degrees and depressed 7 degrees below the horizontal by means of a rack and pinion type gear. As usual, the whole turret is mounted on a ball race, the outer ring of which is fixed to the hull and incorporates a traversing rack. Both turret traverse and gun elevation are normally performed by the gunner, either by hand or using electrical power.

GUN AND AMMUNITION

The armament of the Vickers tank follows the practice well proven in the Centurion. In particular, its 105mm L7A1 gun is the same as that of the Centurion, as well as virtually the same as that of the US M60, M60A1, M60A3, M48A4, Swiss Pz.61 and Pz.68, German Leopard, and the Japanese STB-1. It also fires the same two types of ammunition. One is the armour-piercing discarding-sabot, or APDS, and the other is the high-explosive squash-head, or HESH.

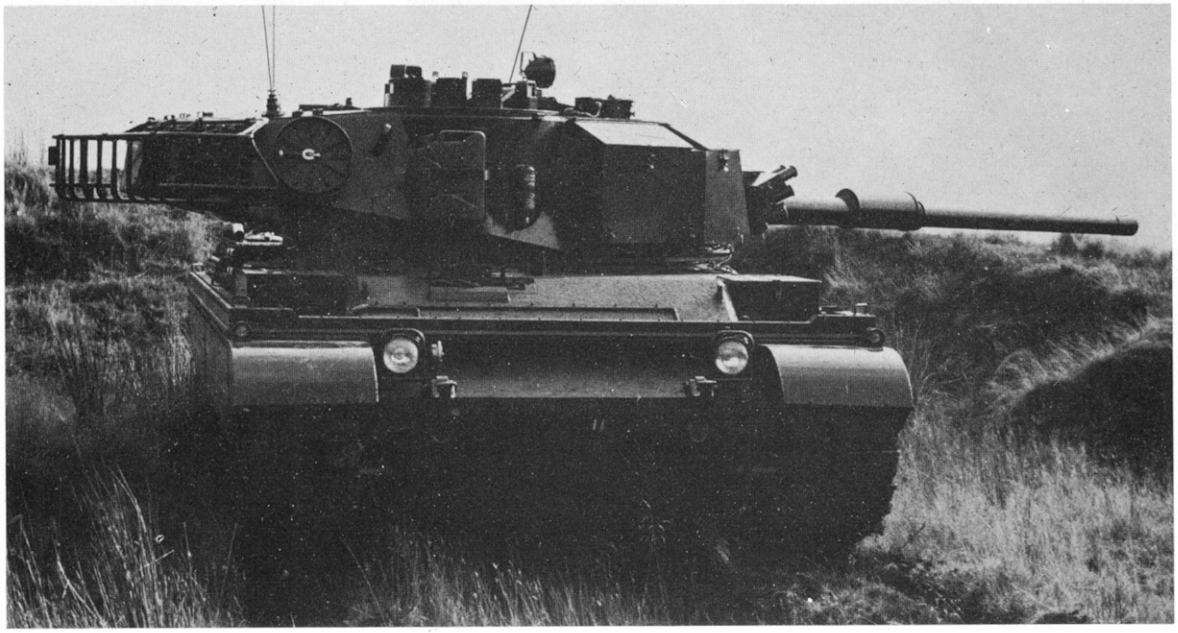
The APDS has been used for many years in British tanks and, after them, in others as the principal type of ammunition against other tanks because it gives a higher probability of knocking out opposing tanks than other types of ammunition, such as high-explosive anti-tank, or HEAT, rounds with shaped-charges which have been favoured in the United States and in France. In particular, the very high, 1470 m/s, muzzle velocity and consequently the very short time of flight of the 105mm APDS projectiles give them a very high probability of hitting enemy tanks. Given a hit, the combination of high velocity and the high sectional density of the tungsten alloy APDS shot enables it to perforate thick armour, even at long range. Finally, when the enemy tank has been hit and its armour perforated by an APDS shot, the fragmentation produced by it inside the tank is highly lethal. Thus, by fulfilling to a very high degree the successive requirements of hitting an enemy tank, perforating its armour and inflicting lethal damage inside, the APDS ammunition gives the Vickers tank a very high first round 'kill' probability.

Effective as it is against heavily armoured vehicles, the APDS ammunition is relatively ineffective against other targets, because of its specialised nature. For engaging unarmoured or lightly armoured targets tanks have been provided with conventional high explosive, or HE, ammunition but this, in turn, is relatively ineffective against all but the lightest armoured vehicles. In consequence, British tanks have been provided with HESH ammunition which is effective on the one hand against enemy troops in the open and on the other against armoured vehicles, as well as buildings, concrete fortifications and bunkers. HESH rounds cannot, of course, compete with APDS when it comes to destroying enemy battle tanks, but they can cause serious damage to them. The ability to do this, as well as to destroy other,

Side view of a Mark 1.

Rear view of a Mark 1.

Mark 1 with turret traversed to the left.



Close up of the prototype showing the 12.7mm ranging machine-gun and the 0.30in. coaxial machine-gun alongside the 105mm gun.

Mark 1 firing its 105mm gun.

softer targets, is particularly valuable on the battlefield when the situation is confused and tank crews do not know what type of target might appear at any instant. Under such conditions HESH is invaluable as it gives tank crews a chance of engaging virtually any type of target with a reasonable degree of success and without having to use precious time to select some more specialised type of ammunition to suit the particular target.

FIRE AND GUN CONTROLS

Because their muzzle velocity of 730 m/s is relatively low, HESH rounds are much more dependent on knowledge of the range of the target for hitting it than the APDS rounds, but even the latter benefits from accurate range information, particularly when targets appear at more than 800 or 1,000 metres. In consequence, the Vickers tank is fitted with a ranging system but this is based on a 12.7mm ranging machine-gun, instead of the optical range-finders adopted in contemporary US, French, German and Swiss tanks.

The 12.7mm machine-gun is mounted alongside the 105mm gun and is used for ranging, in conjunction with a ballistic graticule, by firing a series of short, 3-round bursts and observing the fall of the tracer bullets. A similar system had also been adopted on the final versions of the Centurion and also in the Chieftain in preference to an optical range-finder system because it is simpler, less expensive and far more robust, which makes it more reliable. Moreover, it can take into account such factors as cross-wind and the cant of the gun trunnions when the tank is sideways on slopes, which the optical range-finder cannot do. It is also easier to use when the light is poor or when the target, such as bushes hiding an anti-tank weapon, does not have sharp contours.

To preserve its ballistic characteristics, the use of the 12.7mm machine-gun is restricted to ranging fire and the tank carries 600 rounds for this purpose. For other purposes there is a 'co-axial' 0.3in. machine-gun, for which there are 3,000 rounds. There is also provision for mounting a second 0.3in. machine-gun, externally, on the roof of the turret. The ammunition carried for the 105mm gun amounts to 44 rounds, most of which are stowed in the front of the hull to the left of the driver, while the remaining ready rounds are carried on the turret turntable platform. The gun is loaded manually but ejects spent cartridge cases automatically and can be fired at the rate of 12 rounds per minute. In fact, at a demonstration a Vickers tank hit 10 targets, at ranges varying from 600 to 1,000 metres, in 55 seconds.

Like the Centurion and the Chieftain, the Vickers battle tank is fitted with an all-electric gun control and stabilisation system, which provides power control and stabilisation for the gun in elevation and for the turret in azimuth. When the system is operated in the non-stabilised mode, which can be used when the tank is stationary, the turret is power-driven in traverse according to the gunner's duplex controller and the gun is controlled in elevation by the gunner's handwheel. When stabilised operation is selected the gun and turret are both power-controlled and the gun is held in space on a fixed bearing even when the vehicle is moving by reference to a two-axis gyro unit mounted on the gun. In an emergency, the turret can be driven in traverse and the gun elevated manually by the gunner.

In principle, the gun control and stabilisation system adopted for the Vickers tank is similar to those of the Centurion and Chieftain. It is, however, a more advanced, transistorised GEC-AEI system with improved performance which reduces the time taken to lay the gun on target. Therefore, it offers the Vickers tank a significant advantage over the Centurion and the Chieftain and also over the Russian T-55 and T-62, as well as other contemporary tanks which are not provided with stabilisation in elevation and traverse.

The advantage of the Vickers tank over tanks not fitted with stabilisation equipment is not that it can fire its gun accurately on the move, which no tank has been able to do so far. However, since its gunner's sight is stabilised with the gun, stabilisation gives the gunner the great advantage of being better able to acquire targets on the move and to lay the gun so that it requires a minimum of fine adjustment when the tank comes to a short halt to fire with the high degree of accuracy of which it is capable. In other words, the Vickers tank can engage targets more quickly from the move, even if it has to stop, like all tanks, to fire its gun accurately. Stabilisation

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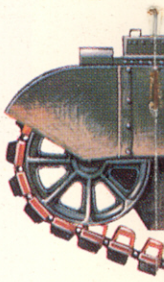
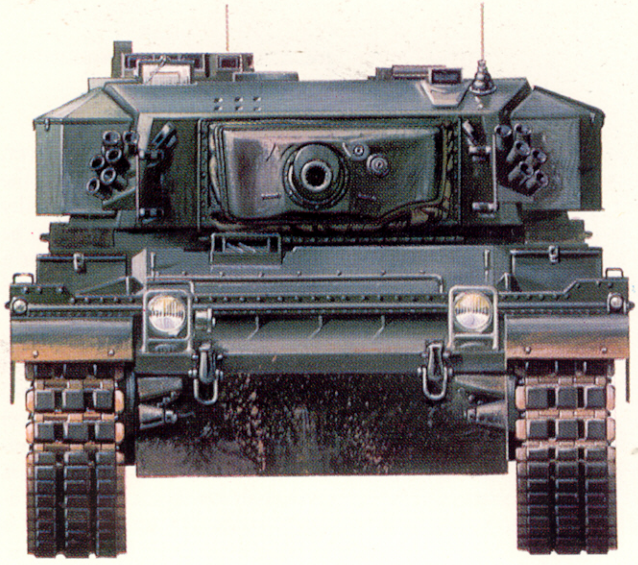
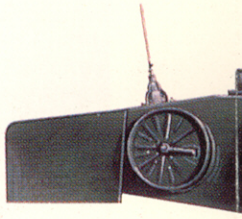
Vickers battle tank
Mark 1 *(four views)*

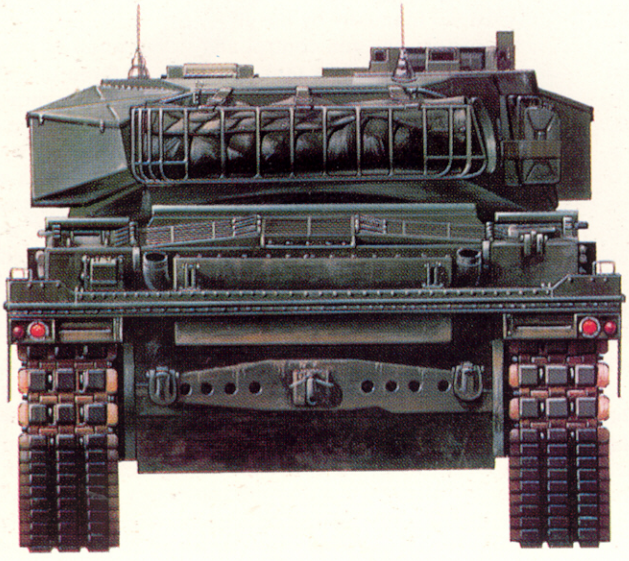
T. Hadler © Profile Publications Ltd.

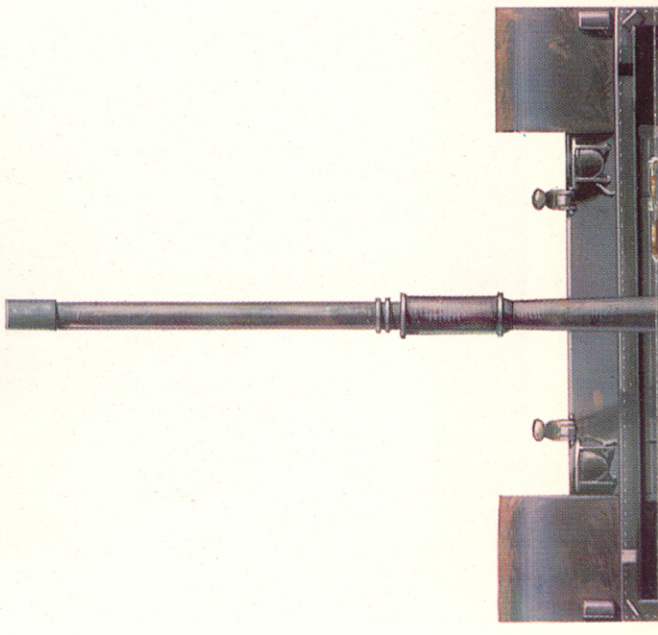
Mark 3 turret (Model)

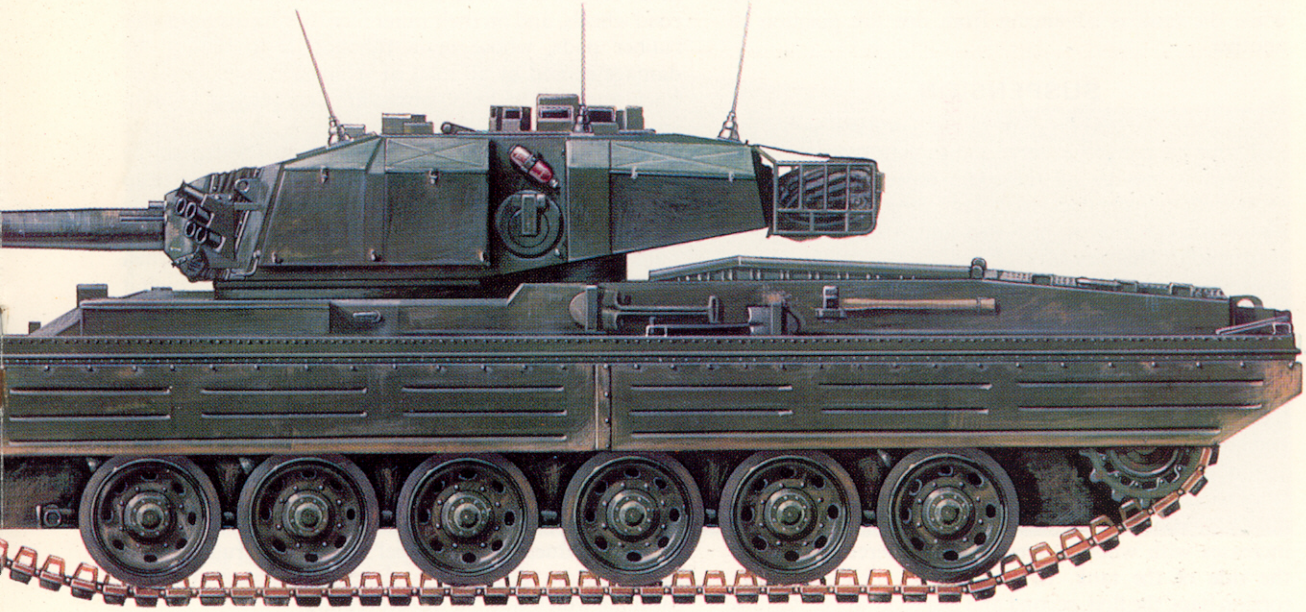


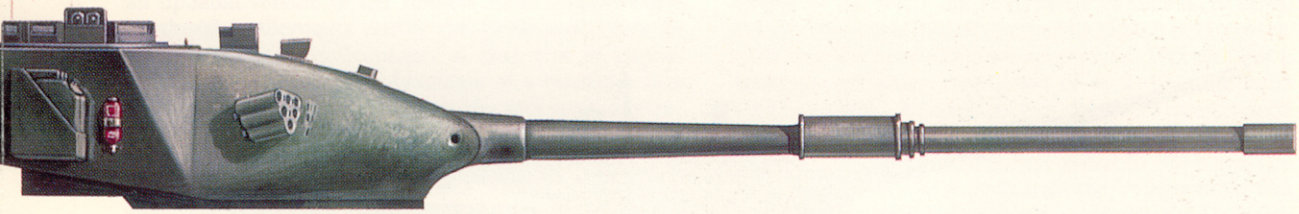


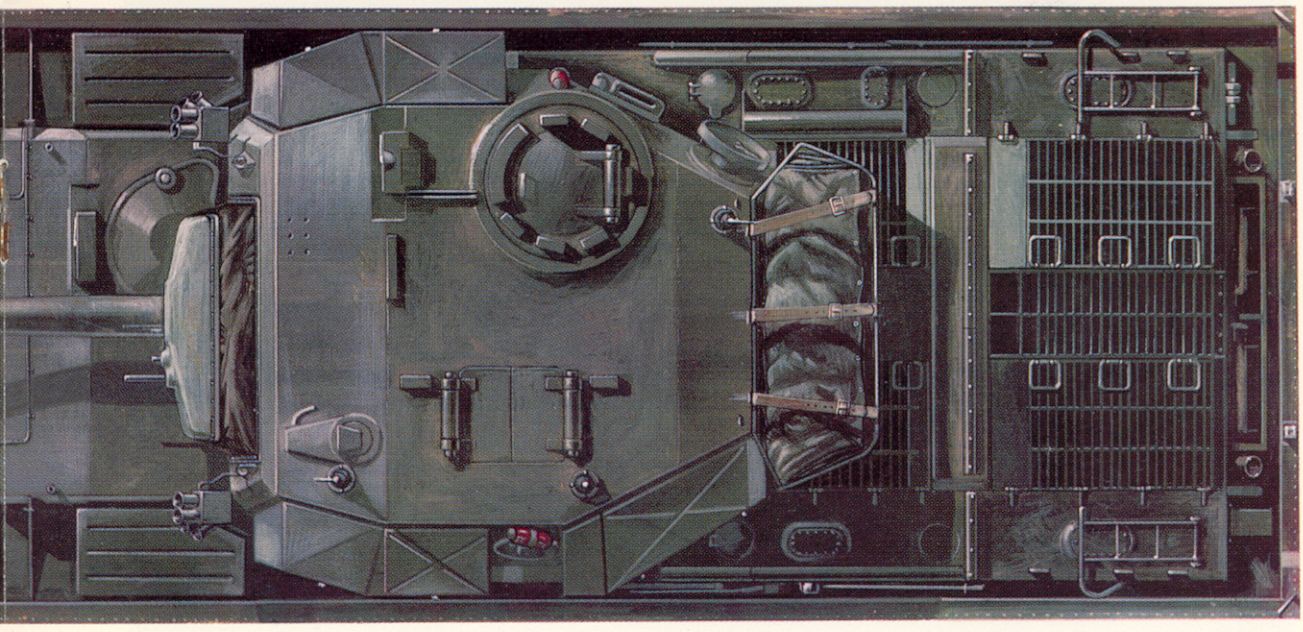












also makes possible a more effective use of the co-axial machine-gun, particularly to deliver protective fire while the tank is advancing from one fire position to another.

SUSPENSION

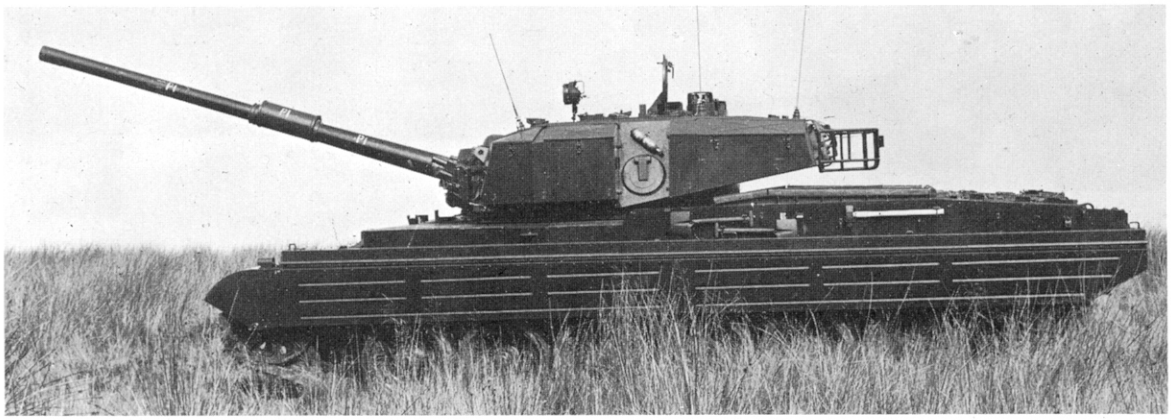
Apart from the stabilisation of the gunner's sight, the ability of the crew to observe and to detect targets when the tank is moving off the road, especially when it is 'buttoned up', depends to a very large extent on the quality of the ride it provides and, therefore, on its suspension. This consists of six double, rubber-tyred road wheels on each side which are mounted on trailing arms and independently sprung by transversely located torsion bars. To prevent corrosion and to protect their highly stressed skins from being scratched, the twelve hull-mounted torsion bars are wrapped. In addition there are also short torsion bars within the first, second and last trailing arms on each side which are brought into action, when the arms approach the bump position, by stops fixed to the hull. This most unusual spring arrangement approaches the ideal of a spring rate which increases with wheel movement and thereby improves the ride of the tank. In addition to their secondary torsion bars, the first, second and last road wheel stations on each side are fitted with hydraulic dampers.

The road wheels run on tracks with cast manganese steel shoes which are jointed by plain, case-hardened steel pins. The shoes have a central guide lug on their inner face, which locates the track between the double road wheels, and on their outer face they have removable rubber pads, whose main function is to reduce the damage caused by all tracked vehicles to road surfaces. Each track has 96 links, whose nominal pitch is 152mm, and its width is 520mm, which leads to a moderate nominal ground pressure of 0.9 kg/cm^2. The top of the track is supported by three rubber-tyred rollers fixed to each side of the hull and each of the two front idlers incorporates a device for adjusting the tension of the track: if the track is slack it might be thrown off when the vehicle executes a turn but if its tension is too high it might absorb an undue amount of engine power.

LEYLAND L.60 ENGINE

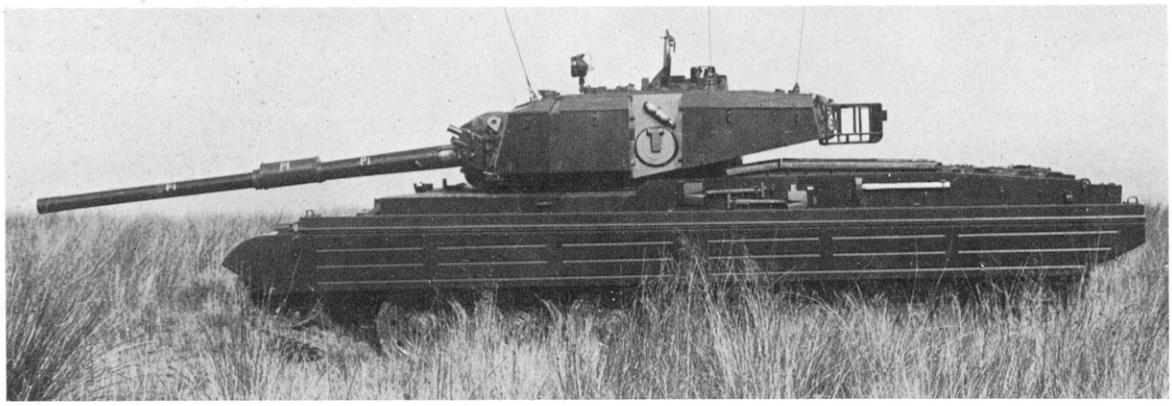
The engine of the Vickers tank is a Leyland L.60 two-stroke, opposed-piston, six-cylinder, water-cooled diesel. It was originally developed for the Chieftain, following a 1957 NATO decision to abandon spark-ignition gasoline engines in favour of the so-called 'multi-fuel' engines, which are, in effect, diesels. However, to give them their due, the 'multi-fuel' engines can run on fuels ranging from diesel oil to kerosine without the precautions which normal diesels require.

The unusual, opposed-piston layout was adopted in the L.60 engine because the crowns of the opposing pistons form a hot-walled combustion chamber which



Prototype with 105mm gun at maximum elevation.

Prototype with 105mm gun at maximum depression.



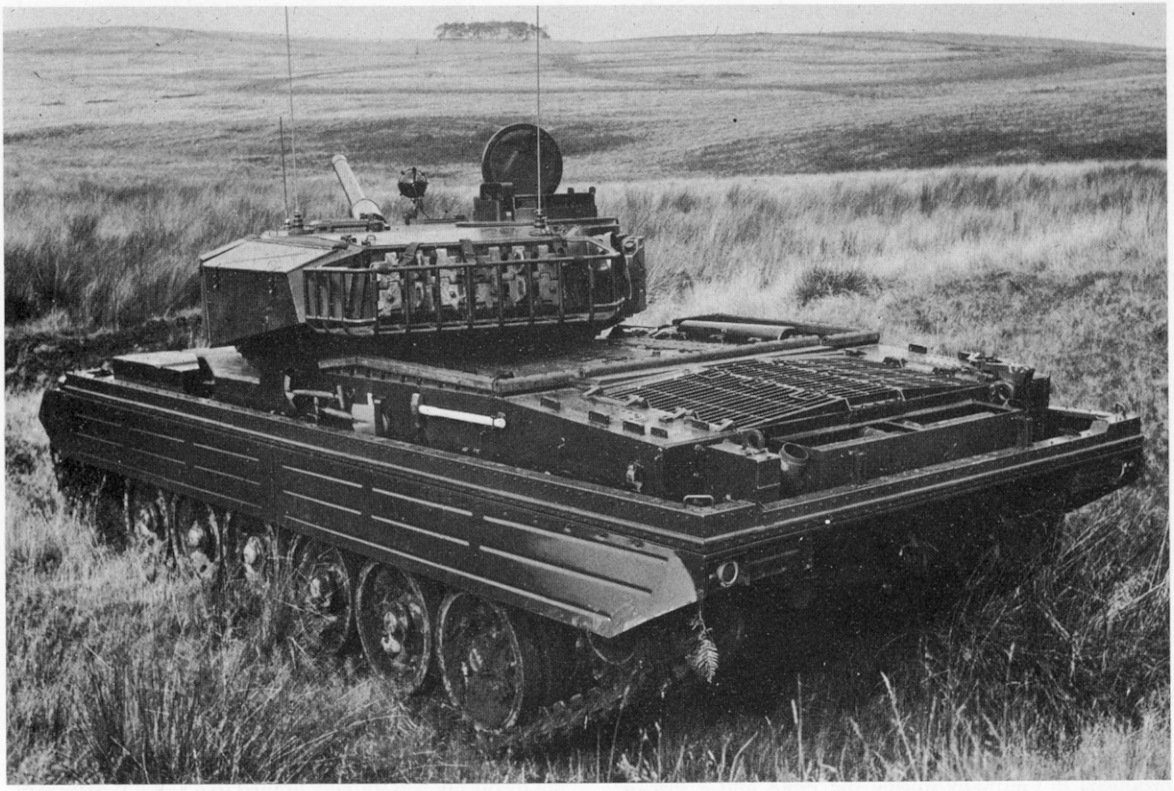
View showing the independently sprung road wheels.

was considered more favourable to the burning of a wide range of fuels than other, more conventional diesel combustion chambers. In essence, however, the L.60 is an updated version of the Junkers Jumo aircraft diesel produced in Germany during the 1930s and it has the advantages and disadvantages of that type of engine. In particular, it has the advantages of a relatively high specific output and of a low specific fuel consumption. But, at the same time, its pistons are more highly stressed than those of more conventional diesels and therefore potentially troublesome. It is not surprising, therefore, that when the L.60 engine was initially installed in the Chieftain it gave a good deal of trouble. However, it proved satisfactory from the start in the Vickers tank because the latter is 14 tonnes lighter than the Chieftain and, consequently, on average it demands less of its engine. Thus, the lower power requirements result in the pistons and other engine components being less highly stressed, which makes them more durable.

The L.60 engine was designed to produce a gross output of 700 b.h.p. out of its swept volume of 19 litres, but its output was initially limited to 550 b.h.p. However, even this has been sufficient to give the Vickers tank a nominal maximum road speed of 48 km/h, compared with Chieftain's 40 km/h. In fact, the prototype attained a road speed of 55 km/h during its trials and later vehicles had their engine output raised to 600 b.h.p.

In addition to the L.60 engine, the Vickers tank, like the Chieftain, also has an auxiliary engine, the Coventry Climax H.30. This is also an opposed-piston, two-stroke diesel but with only three cylinders and a total swept volume of 1 litre. Its main function is to drive a second 24-volt generator when the main engine is not running and the generator geared to it is inoperative.

Mark 1 showing its rubber padded tracks.



Rear view showing the louvres over the engine compartment.

Rear view with louvres hinged sideways for access to the engine and transmission compartment.

Mark 1 demonstrating its ability to move across muddy terrain.

The engine cooling system consists of one radiator mounted horizontally on each side of the main engine and two cooling fans mounted vertically between the engine and the transmission. Cooling air is drawn in through louvres above the engine and flows through the radiators and the fans before being discharged through outlet louvres over the transmission. The cooling fans are belt-driven off the main engine but there is also a hydraulic drive for the left hand fan for use when the main engine is stopped but the auxiliary engine is running. The complete power pack can be removed as one unit from the engine compartment by disconnecting the main coupling, fuel and exhaust connections together with the accelerator control and air supply conduit to the generator.

TN.12 TRANSMISSION

Drive from the engine is taken through a centrifugal clutch to a TN.12 transmission designed by Self-Changing Gears Ltd. This is commonly called a Merritt-Wilson transmission as it incorporates an epicyclic gearbox of the type originally designed by Major W. G. Wilson and a triple differential steering system introduced in the Merritt-Brown transmission used in British tanks from the Churchill to the Centurion.

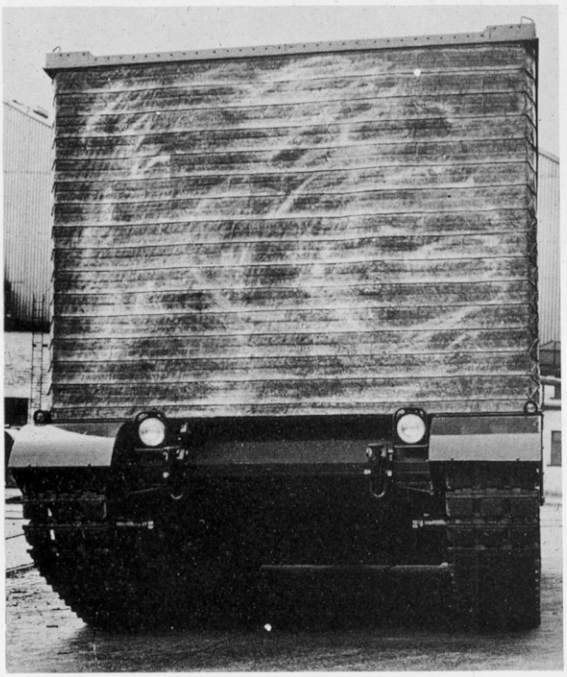
The TN.12 transmission was originally produced for the Chieftain, but it was developed from the TN.10 transmission designed for the FV.300 light gun tank which was considered by the British Army in the late 1940s and early 1950s. It is interesting to note that the suspension of the Vickers battle tank was also evolved

Mark 1 moving off the road.

from that of the FV.300, but in this case directly and not by inheritance via the Chieftain.

The gearbox of the TN.12 transmission provides six forward and two reverse speeds. Speeds are changed by means of a toe-operated controller and there is a device which automatically inhibits down changes when the speed of the vehicle is too high. Sequential down changes are also made automatically when the vehicle speed is reduced, and there is an automatic return to neutral when the engine is switched off.

Like others of its kind, the triple differential steering system incorporated in the TN.12 transmission gives radii of turn which decrease as the gears in the gearbox are changed down, as is generally required. It also provides a neutral, or pivot, turn when the gearbox is in neutral, by driving the tracks in opposite directions. Steering is controlled by hydraulically applied caliper disc brakes with a mechanical interlock to prevent their simultaneous engagement.



View of the front of a Vickers battle tank with its flotation screen erected.

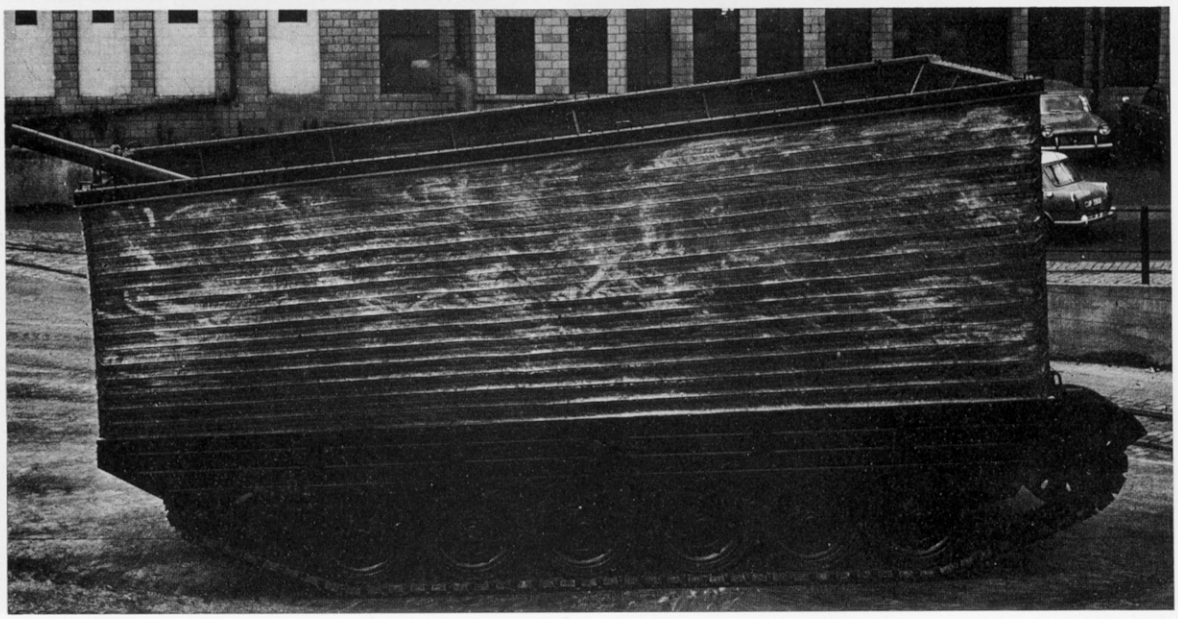
FLOTATION EQUIPMENT

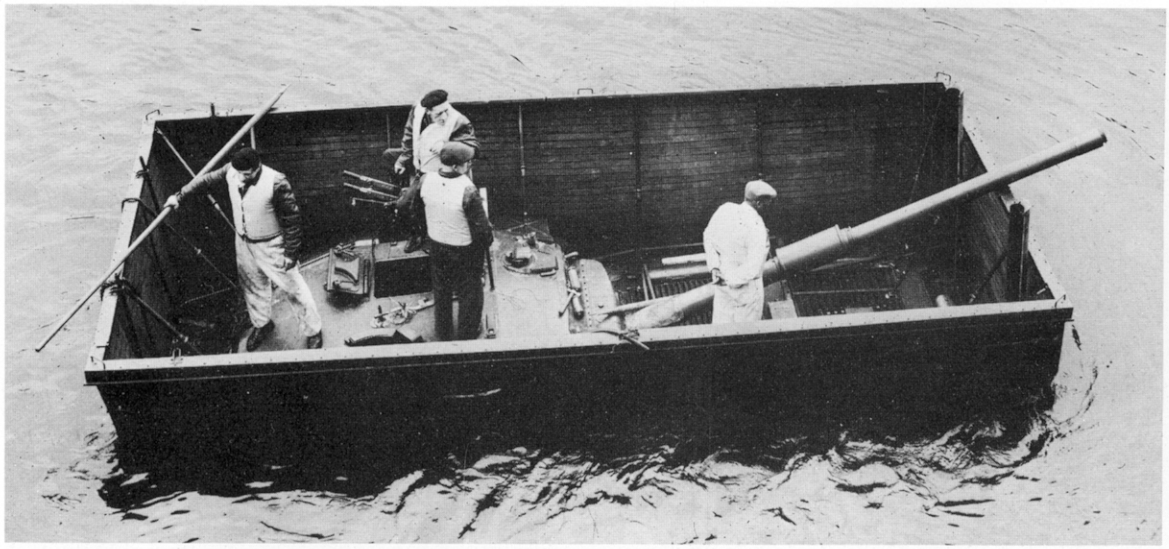
The 'hot-shift' transmission of the Vickers tank is one of several factors which contribute to its high mobility. Others, apart from its relatively light weight and a power-to-weight ratio of 16 b.h.p. per tonne, are its road range of 600 km and its ability to cross trenches 2.5m wide – because of its relatively long length. It is also capable of fording water obstacles 1.1m deep without any preparation and 2.2m deep with preparation. What is more, it can be fitted with a collapsible flotation screen which enables it to swim across water obstacles too deep for fording.

Collapsible flotation screens were first used in action fitted to M4 Sherman tanks during the latter part of the Second World War and they have been tried on several tanks since then, including the Centurion. However, the Vickers tank was the first one of its size to be produced with a flotation screen.

The screen is made of reinforced nylon fabric and is normally stowed, folded, in an aluminium trough which is bolted to a permanent flange welded to the hull at trackguard height. When extended to the flotation position the screen is held rigidly in position by turnbuckles attached to the hull and turret. Before the screen can be erected the 105mm gun has to be brought to its maximum elevation of 20 degrees to clear it, and it takes the crew 15 to 30 minutes to erect the screen. However, to lower it so that the driver has a clear view ahead requires only 2 minutes. When afloat the tank can propel itself by means of its tracks at up to 6.4 km/h.

Side view of a Vickers battle tank with its gun pointing to the rear at maximum elevation and the flotation screen erected.





Vickers battle tank swimming with the aid of its flotation screen.

PRODUCTION AND DEVELOPMENT

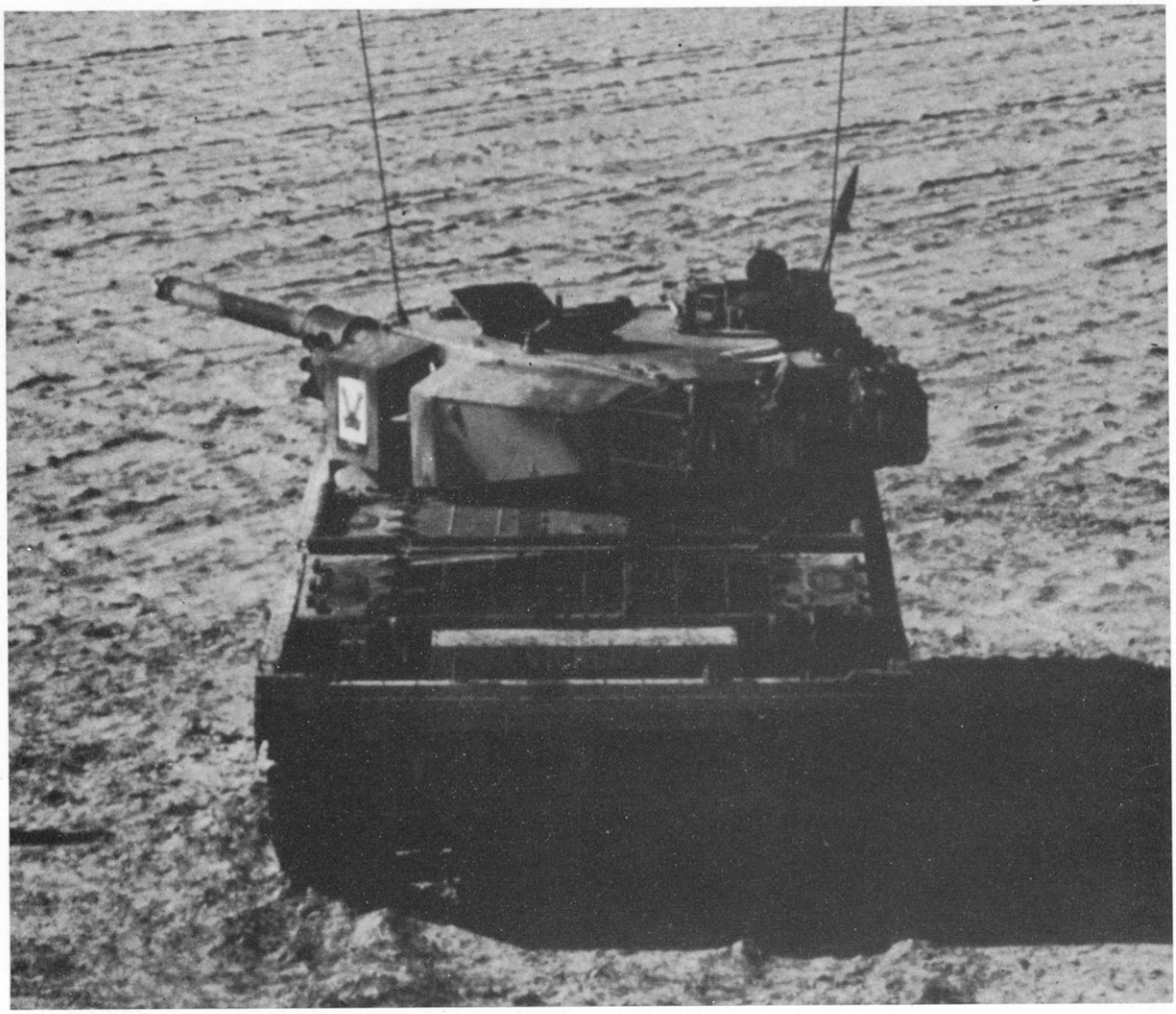
The above features were all incorporated in the original, Mark 1 version of the Vickers tank which was adopted by the Indian Army as its main battle tank. As a result of this the tank was put into production in 1964. The first batch of vehicles was built at the Vickers Works in Newcastle-upon-Tyne, from where the first production model was delivered to the Indian Army in 1965. However, in 1966 the factory built for the purpose at Avadi, near Madras, also began to produce tanks – the first tanks ever to be produced on the Indian sub-continent.

The first tank built in 1966 in India still incorporated many British-made components but later vehicles were almost entirely Indian-made. The Indian Army named the tank Vijayanta, which is Sanskrit for 'Conqueror', and by 1971 it was estimated by the International Institute for Strategic Studies to have about 300 Vijayantas in service, in addition to the Centurions imported earlier and the T-54 and T-55s delivered more recently by the Soviet Union, as well as some obsolescent US-built M4A3 Sherman tanks.

As production of the Vickers battle tank for the Indian Army shifted from Britain to India, its manufacture in Newcastle did not stop, because Vickers received another order for it, from Kuwait. This followed an agreement reached in 1968, which led to the first tank being delivered to Kuwait in January 1971. The version supplied to Kuwait was essentially the same as the Mark 1 developed for India but it incorporated a number of minor modifications.

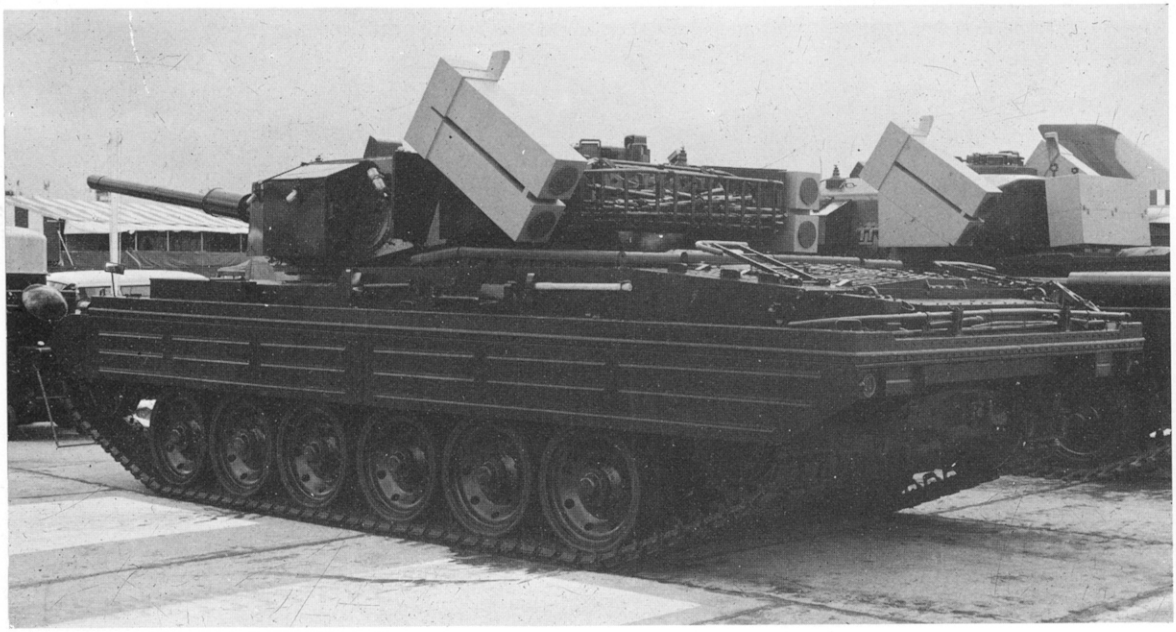
Other countries have also shown interest in the tank and Vickers have continued to develop it. Thus, in 1966 they brought out in collaboration with the Guided Weapons Division of the British Aircraft Corporation a

Vijayanta in service with the Indian Army.



Vickers battle tank Mark 1 in the desert in the Persian Gulf.

Vickers battle tank with a mock up Swingfire installation. (British Aircraft Corporation)



Wooden scale model of the Mark 3.

very interesting prototype of what was to be the Mark 2. This was a Mark 1 modified to carry four Swingfire anti-tank guided missiles in addition to its usual gun armament.

The installation of Swingfires on the Vickers battle tank represented a development of the earlier idea of increasing the firepower of the 83.4mm gun light tank by mounting in it Vigilant guided missiles, which, incidentally, were taken over by the British Aircraft Corporation. However, the Swingfire missiles are much more powerful than the Vigilants and have a much longer, 4,000-metre, range. As a result the Vickers tank with Swingfire missiles possessed a very long range anti-tank capability which has been unmatched by any tank armed only with a gun. In the event the Mark 2 with Swingfire missiles was not put into production, but it has provided an attractive model for future tanks, a proportion of which could well be fitted with guided missile pods to supplement their basic gun armament.

More recently Vickers have designed a Mark 3 version of their battle tank. This stems from Design No. 51400 T and differs from the Mark 1 mainly in having a turret with a well-shaped cast front welded to a fabricated armour plate body. It also has a cast gun mantlet which is better shaped from the point of view of its resistance to armour-piercing projectiles than the flat mantlet of the Mark 1. The front glacis plate is also a casting which improves its ballistic shape. In addition the Mark 3 embodies various other improvements, such as an increase in the depression of its gun from 7 to 10 degrees below the horizontal and an increase in the ammunition stowage to 50 rounds.

Otherwise the Mark 3 version retains the basic characteristics of the Vickers battle tank, which is uncomplicated and robust. At the same time it offers a combination of highly effective armament with a high degree of mobility at a cost which compares favourably with that of other contemporary battle tanks.

SUMMARY OF THE LEADING CHARACTERISTICS OF THE VICKERS BATTLE TANK MARK 1

Gun, calibre	105mm
length	51 calibres
ammunition	44 rounds
Machine-gun, ranging	12.7mm
coaxial	0.30in.
external	0.30in.
Weight, unladen	36,000 kg
laden	38,100 kg
Length, overall, gun forward	9.73m
vehicle only	7.29m
Height, to turret roof	2.44m
to top of periscopes	2.64m
Width, overall	3.17m
Ground clearance	0.41m
Width of tracks	0.52m
Nominal ground pressure	0.9 kg/cm²
Engine, make and model	Leyland L.60
gross horse power	600
Maximum road speed	48 km/h
Range, on roads	600 km
Crew	4

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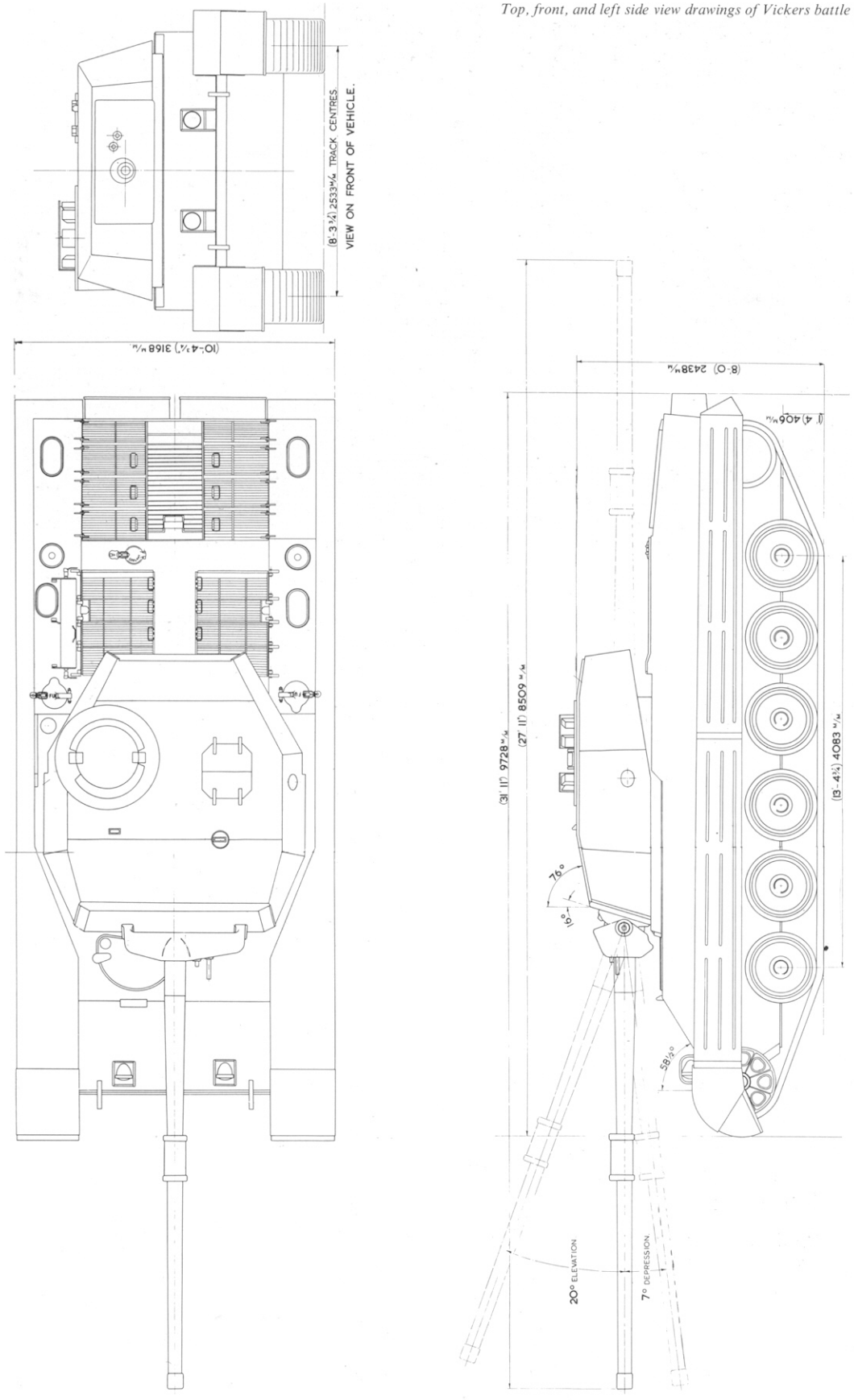
ACKNOWLEDGEMENTS

The author wishes to thank Colonel B. S. Heath, of Vickers Limited, for information about the history and characteristics of the Vickers battle tank, and the Armament Division, Vickers Ltd., and the Guided Weapons Division, British Aircraft Corporation for their generous help with photographs.

Top, front, and left side view drawings of Vickers battle tank Mark 1.



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Elefant and Maus (+E-100)

by Walter Spielberger and John Milsom

Elefant was the conversion of the original Porsche Tiger tank design into a self-propelled tank destroyer. "It turned out to be a technically most complicated and unreliable vehicle. This is said despite the fact that your author was engaged as design engineer on this project and that he participated actively in the action in Russia described at the beginning of this *Profile*."
Maus the largest armoured fighting vehicle ever built, was the culmination of Porsche technical development in the Tiger field. E-100 was the Maus's rival.

Commando and Twister Armored Cars

by Christopher F. Foss

Although mainly devoted to the multi-mission Commando vehicle (which saw extensive service with the United States Army in Vietnam), and the Lockheed Twister (which consists of two bodies joined by a pivotal yoke), this *Profile* by a leading expert on modern AFVs also describes the Chrysler SWAT and the more interesting high mobility/off road vehicles developed by the US Army in the past few years: Gama Goat, Terra Star, PATA, XM-759 Marginal Terrain Vehicle, Air Roll, and the GOER series.

AMX-30 Battle Tank

by R. M. Ogorkiewicz

"At first sight the AMX-30 looks like most other battle tanks of the 1960s and 1970s. On closer inspection, however, it proves to differ from its contemporaries in several important respects. In fact, its design embodies a number of novel ideas which make it one of the most interesting of modern battle tanks . . .
"The most unusual feature of the AMX-30 from the start nas been its main armament. This consists of a 105mm gun which fires a unique type of armour-piercing shaped charge projectile . . ."

Vickers Battle Tank

by R. M. Ogorkiewicz

"Tank design has become a monopoly of government departments, even where free enterprise has survived in the field of tank production because the designs produced by industry are government prescribed. There is, however, one very notable exception to this in the Vickers battle tank. This tank was designed by Vickers Limited on their own initiative and its development background is very different therefore from that of all other contemporary battle tanks. The enterprise which Vickers have displayed in developing their battle tank is, however, in keeping with their long and distinguished record in the tank field." The Mark I version of the tank has been adopted by the Indian Army as its main battle tank. Production is carried out near Madras – and these are the first tanks ever to be produced on the Indian sub-continent. The Indian Army has named the tank Vijayanta, which is Sanskrit for "Conqueror". Other Vickers battle tanks are manufactured in Newcastle-upon-Tyne and have been supplied to Kuwait. Development of the tank continues and the new Mark 3 version has a number of improvements including increased depression of the 105mm gun, increased ammunition stowage, and a glacis plate with improved ballistic shape. The tank, weighing 38 tonnes, or 37½ English tons, laden (hence its name the Vickers 37-ton Tank), is uncomplicated and robust, and offers "a combination of highly effective armament with a high degree of mobility at a cost which compares favourably with that of other contemporary battle tanks."

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by Major-General N. W. Duncan

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